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**THE NETHERLANDS'
MIXED FEED INDUSTRY**

**its impact
on use of grain for feed**

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ABSTRACT

Grain use in concentrated feeds in the Netherlands has declined because of increased use of lower cost substitutes. Manioc chips and meal and corn gluten are two major feed grain substitutes used in mixed feeds. High grain prices in the European Community have encouraged the use of grain substitutes. In addition, the Dutch mixed feed industry is highly developed, making extensive use of linear programming in formulating least-cost rations. Increased use of grain substitutes in other countries of the European Community is likely.

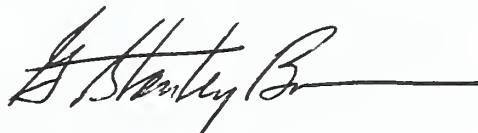
Key Words: Netherlands, mixed feed industry, grain substitutes.

FOREWORD

One rather absorbing development in the feed manufacturing industry of the Netherlands has been the decline in the use of grains in mixed feeds despite industry expansion and rising livestock numbers. This report discusses in some detail the reasons for this development, the ingredients being substituted for grains, the structure of the Dutch mixed feed industry, and the implication for the future for the whole of the European Community.

Developments in the Community's livestock feed complex are of major importance to the United States. In 1968, for example, the United States exported to the Community \$841 million of feed grains, corn byproducts for feed, oil cake and meal, and oilseeds. These commodities accounted for 62 percent of our nearly \$1.4 billion agricultural exports to the Community.

The authors gratefully acknowledge the assistance and inspiration provided to them by the U.S. Agricultural Attache's Office in The Hague. Especially helpful were Brice K. Meeker, U.S. Agricultural Attache, and Koy L. Neeley and David W. Riggs, Assistant Agricultural Attaches (the latter, formerly). However, any errors in the data or in the analysis are fully the responsibility of the authors.

A handwritten signature in dark ink, reading "G. Stanley Brown", followed by a long horizontal line extending to the right.

G. Stanley Brown, Chief
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SUMMARY

Grain use in concentrated feeds in the Netherlands declined from 4.1 million tons to 3.3 million tons between 1960/61 and 1967/68. This decline occurred despite steady increases in both concentrate feed consumption and livestock output. Compound feed production increased from 4.6 million tons to 6.6 million tons during the same period.

The shift from grain to nongrain components in concentrate rations has adversely affected U.S. grain and feed trade with the Netherlands. This is because our market share of the Netherlands' imports of "other feeds" is only about half as large as our share of Dutch feed grain imports.

Feeding of grain has been discouraged by changing price relationships which favor nongrain feed ingredients. Since 1962, variable levies of the Common Agricultural Policy (CAP) have increased import prices of grain substantially.

Levies and duties of a proportionate magnitude have not been applied to several products that compete with grain. For example, since 1962, levies or duties on corn gluten, beet pulp, and brewers waste have remained at zero. Levies or duties on manioc chips and meal have increased about \$4.50 and \$7.00 per ton, respectively, since 1962. On the other hand, the variable levy on corn and sorghum in the Netherlands has increased over \$30 per ton.

Growth in the size of the mixed feed industry and advances in technical expertise have been important factors affecting the demand for various livestock feed ingredients in the Netherlands. When the European Community (EC) began to unify grain policies in 1962, the Netherlands' feed industry was already processing over 80 percent of all concentrated livestock feeds. As grain prices rose, the feed industry made greater use of linear programming in selecting the most economically priced ingredients. Feed mixers are now using a variety of grain substitutes and will continue to as long as their price makes their use economical.

In 1967/68, grain composed 45 percent of total concentrate feed rations in the Netherlands, compared with about 68 percent in 1960/61. Although all grain will not be replaced in livestock rations, it is estimated that continued grain price increases could lead to further substitution.

There are many potential threats to U.S. feeds in the Netherlands and other EC countries. These threats stem largely from unpredictable policy decisions by the Community in attempting to dispose of surplus agricultural products. Current programs aim at disposing of large quantities of domestically produced sugar and nonfat dry milk in feed. Surplus soft wheat poses the largest single threat to the U.S. share of the EC feed grain market. A decision by the EC to substantially increase use of surplus wheat in livestock rations--through target price adjustments or denaturing premiums--could further impair U.S. feed grain exports to the EC.

THE NETHERLANDS' MIXED FEED INDUSTRY--ITS IMPACT ON USE OF GRAIN FOR FEED

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INTRODUCTION

Cereals, oilseeds, and animal feeds are the three major agricultural commodity groups imported from the United States by the Netherlands. From 1965 through 1967, imports of these commodities from the United States averaged \$274 million annually and accounted for about 75 percent of U.S. agricultural products imported by the Netherlands. Consequently, factors affecting the Netherlands' importation and use of these commodities are of major interest to the United States.

The feed economy of the Netherlands experienced significant change during the 1960's. In the beginning of the decade, grain began to be relatively less important as an ingredient in livestock rations. At the same time, use of some lesser known feeds and grain byproducts began increasing. This development is of interest to the United States not only because of this country's trade with the Netherlands, but also because of its possible implications for other U.S. markets.

Many factors interact to determine the amount and composition of feeds produced for and utilized by the livestock industry. It is estimated that over 95 percent of all concentrates consumed by livestock in the Netherlands are commercially mixed (84 percent in 1964/65). Thus, the feed mixing industry is important in determining the type of concentrated feeds used in the livestock industry. This paper analyzes some of the factors underlying the shift in use of concentrates and the development of the mixed feed industry in the Netherlands.

In this report, "mixed feeds" include both complete feeds (i.e., formulated rations) and high protein supplements which are added to grain. Feeds "custom mixed" by livestock producers are not considered as output of the mixed feed industry.

A glossary of selected terms used in this report appears on page 36.

LIVESTOCK INDUSTRY EXPANSION

The Netherlands has traditionally been a producer and exporter of livestock products. Livestock products accounted for 60 to 65 percent of the value of agricultural production during 1955-65; exports of livestock products accounted for 35 to 40 percent of Dutch agricultural exports during the same period. Livestock production is still being pursued vigorously by Dutch farmers despite higher feed and grain prices resulting from the EC's Common Agricultural Policy. Livestock and poultry numbers have expanded, leading to increased feed requirements (see fig. 1 for growth in animal units and app. table 1 for actual numbers). Production of livestock products in the Netherlands has increased because of efficient producers and increased consumer and export demand.

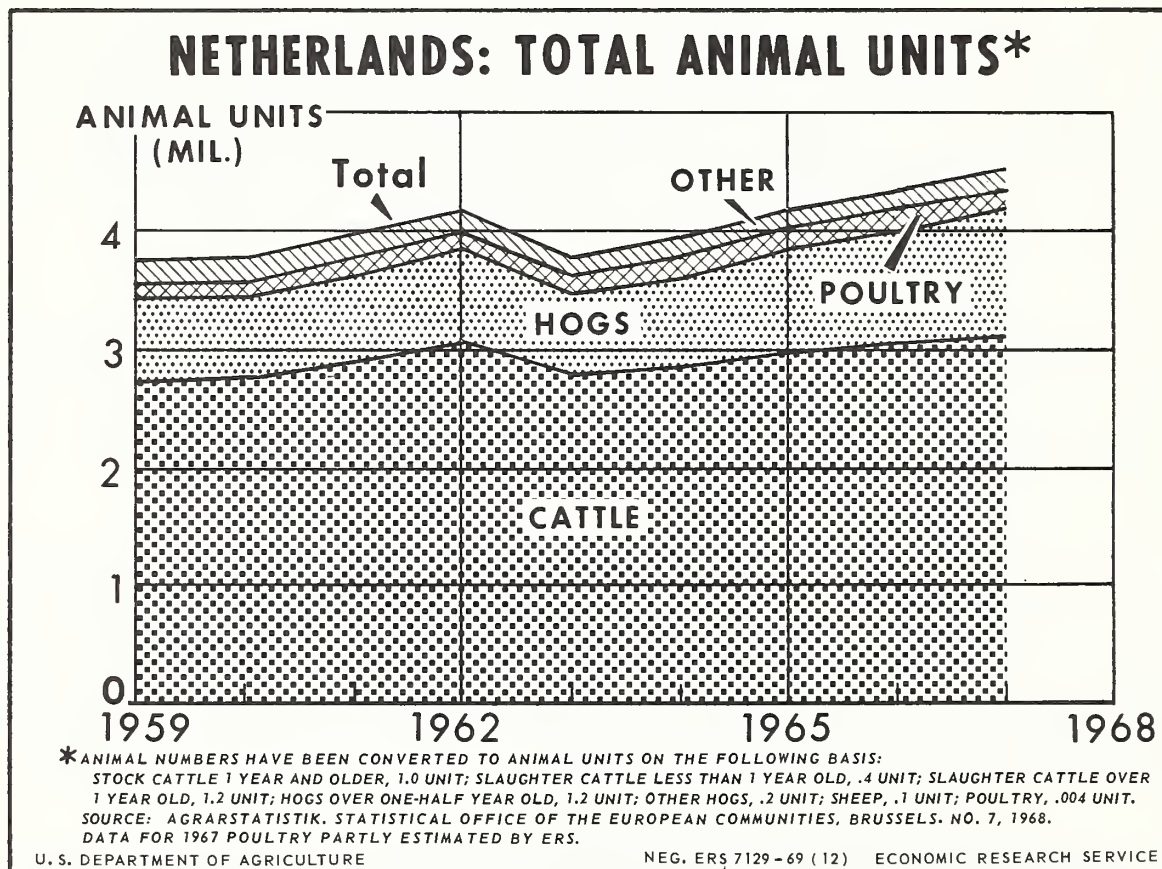
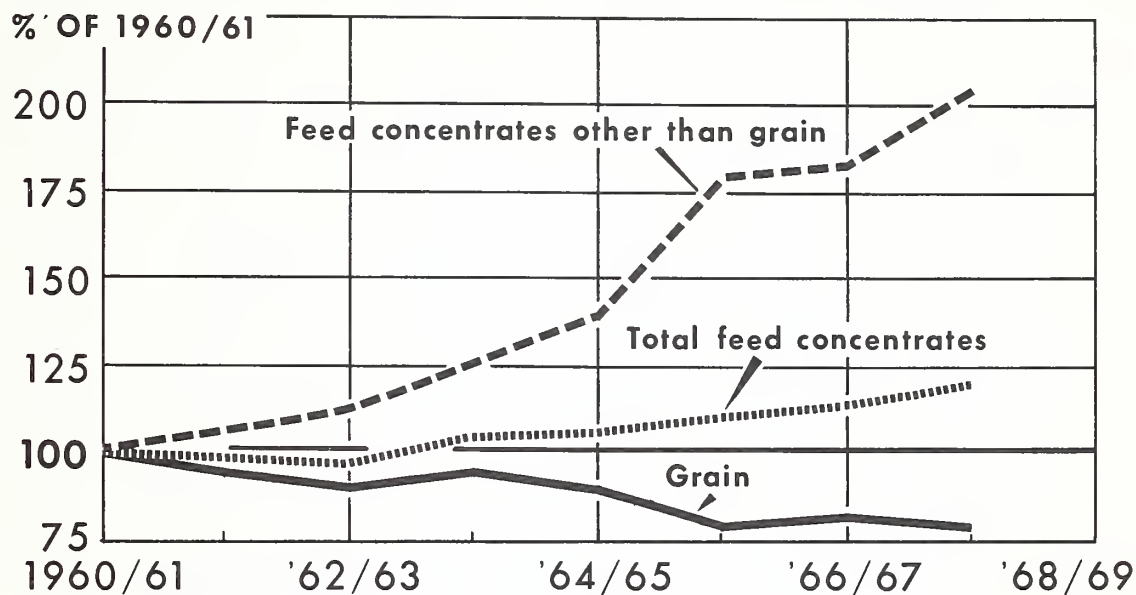


Figure 1

Despite expansion in the livestock and poultry sectors, the amount of grain used for feed in the Netherlands has declined nearly every year since 1960/61. Figure 2 shows that this decline in use of grain has occurred despite increases in consumption of concentrate feeds. Use of concentrates other than grain more than doubled between 1960/61 and 1967/68, while mixed feed production increased by half (see app. table 2 for quantitative data).

NETHERLANDS: PERCENTAGE CHANGE IN CONSUMPTION OF CONCENTRATE FEEDS



SOURCE: APPENDIX TABLE 2.

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Figure 2

Because of the shift in demand for different types of feed ingredients, imports of feed grain (corn, sorghum, barley, oats) fell from 2.7 million tons to 2.3 million tons during 1960/61-1968/69 ^{1/} (app. table 3). While the value of feed grain imports from the United States increased during the 1960/61-1967/68 period (table 1)--reflecting higher import prices--the import value of feed ingredients other than grains increased more than sixfold.

Dutch imports of U.S. feed grain increased from \$56.7 million in 1957/58 to \$126.9 million in 1967/68 (table 1). U.S. sales of other feed ingredients rose sharply from \$.87 million to \$62.5 million during the same period. But the shift from feed grains to other feed ingredients has reduced the potential market for the United States, since our share of the Dutch market is much lower for other feed ingredients than for feed grains (68 percent and 39 percent, respectively, in 1967/68).

^{1/} Unless otherwise indicated, tonnages in this report are metric.

Table 1.--Netherlands: Imports of U.S. feeds and U.S. share of total, 1957/58, 1961/62, and 1967/68

Item	Unit	1957/58	1961/62	1967/68
Feed grains <u>1</u> /.....	Mil. dol.	56.7	100.3	126.9
U.S. share.....	Pct.	52	63.4	68.3
Other ingredients <u>2</u> /.....	Mil. dol.	.87	9.8	62.5
U.S. share.....	Pct.	1.8	11.5	38.6
Total feeds.....	Mil. dol.	57.6	110.1	189.4
U.S. share.....	Pct.	36.5	45.1	54.5

1/ Includes rye.

2/ Primarily oilseeds and meals, gluten feeds, milling offals, and beet pulp.

Source: Foreign Agr. Serv., U.S. Dept. Agr.

GROWTH IN PRODUCTION AND CONSUMPTION OF MIXED FEEDS

Although the feed-mixing industry has been well-established for many years in the Netherlands, it has grown rapidly and many firms have been modernized in recent years. Output nearly doubled between 1955/56-1957/58 and 1967/68--from an average of 3.2 million tons to 6.4 million tons (table 2). 2/ Production of mixed feeds for cattle, pork, and poultry all increased, with the greatest percentage increase occurring in feeds for cattle. Annual production of mixed feed for hogs accounted for more than 40 percent of total output.

Production of feed concentrates is limited by land area and the Dutch farmers' recognition of better alternative uses for land. Over half the agricultural area is in permanent meadows and pastures. Domestic production of raw materials for concentrate feeds increased only 10 percent in nearly 30 years. As early as the midthirties, imports supplied about 50 percent of concentrate feeds. In 1965/66, the proportion was over 70 percent.

The mixed feed industry is basic to the Dutch livestock complex. In recent years, over 95 percent of all concentrate feeds have been premixed, compared with about 20 percent in the United States. The high percentage for the Netherlands can be explained in large part by the small portion of concentrate feeds produced domestically relative to feed requirements.

2/ Since trade has thus far been negligible, production and consumption of mixed feeds are assumed to be equal.

Table 2.--Netherlands: Production of mixed feed by class of livestock, average 1955/56-1957/58, annual 1959/60-1967/68

Year <u>1</u> /	Total	Cattle	Hogs	Poultry	Other
	1,000 metric tons				
Average:					
1955/56-1957/58.....	3,208	710	1,290	1,075	100
1959/60.....	4,425	1,000	1,745	1,580	100
1960/61.....	4,600	1,000	1,755	1,745	100
1961/62.....	5,050	1,250	1,860	1,840	100
1962/63.....	4,900	1,300	1,760	1,740	100
1963/64.....	5,015	1,315	1,825	1,775	100
1964/65.....	5,477	1,428	2,268	1,733	48
1965/66.....	5,961	1,595	2,540	1,764	62
1966/67.....	6,161	1,636	2,648	1,788	89
1967/68.....	6,392	1,678	2,858	1,781	75

1/ Sept. to Aug. for 1955/56 to 1960/61 and July to June for 1961/62 to 1967/68.

Source: (14, p. 88) and Foreign Agr. Serv., U.S. Dept. Agr.

Note: Underscored figures in parenthesis refer to references listed on p. 33.

Mixed feeds for hogs and poultry are very popular in the Netherlands. In 1964/65, about 95 percent of all poultry and hog concentrates were premixed (table 3). Most mixed feeds for hogs and poultry are consumed as a complete ration. About 70 percent of the concentrates used in feeding cattle are in the form of mixed feeds.

Table 3.--Netherlands: Consumption of total feed concentrates, concentrates consumed as mixed feeds, and total grain used for feed, by class of livestock, 1964/65

Item	Unit	Total	Cattle	Pigs	Poultry	Other
Feed concentrates.....	1,000 M.T.	6,442	2,029	2,338	1,823	251
Concentrates consumed as						
mixed feeds.....	do.	5,425	1,425	2,200	1,725	75
As a percentage of total						
feed concentrates.....	Pct.	84	70	94	95	30
Grain used for feed.....	1,000 M.T.	3,704	637	1,530	1,341	196
As a percentage of total						
feed concentrates.....	Pct.	57	31	65	74	78

Sources: (14, p. 88) and (15, p. 261).

Dutch consumption rates of mixed feed per animal are quite high. Figure 3 provides a comparison of mixed feeds consumed per animal in the Netherlands and in the entire EC (including the Netherlands). In 1965, the amount of mixed feeds consumed per head of poultry in the Netherlands was double that of the EC average. For slaughter hogs, the amount was over 2.5 times as great and for milk cows, nearly 3.5 times as large.

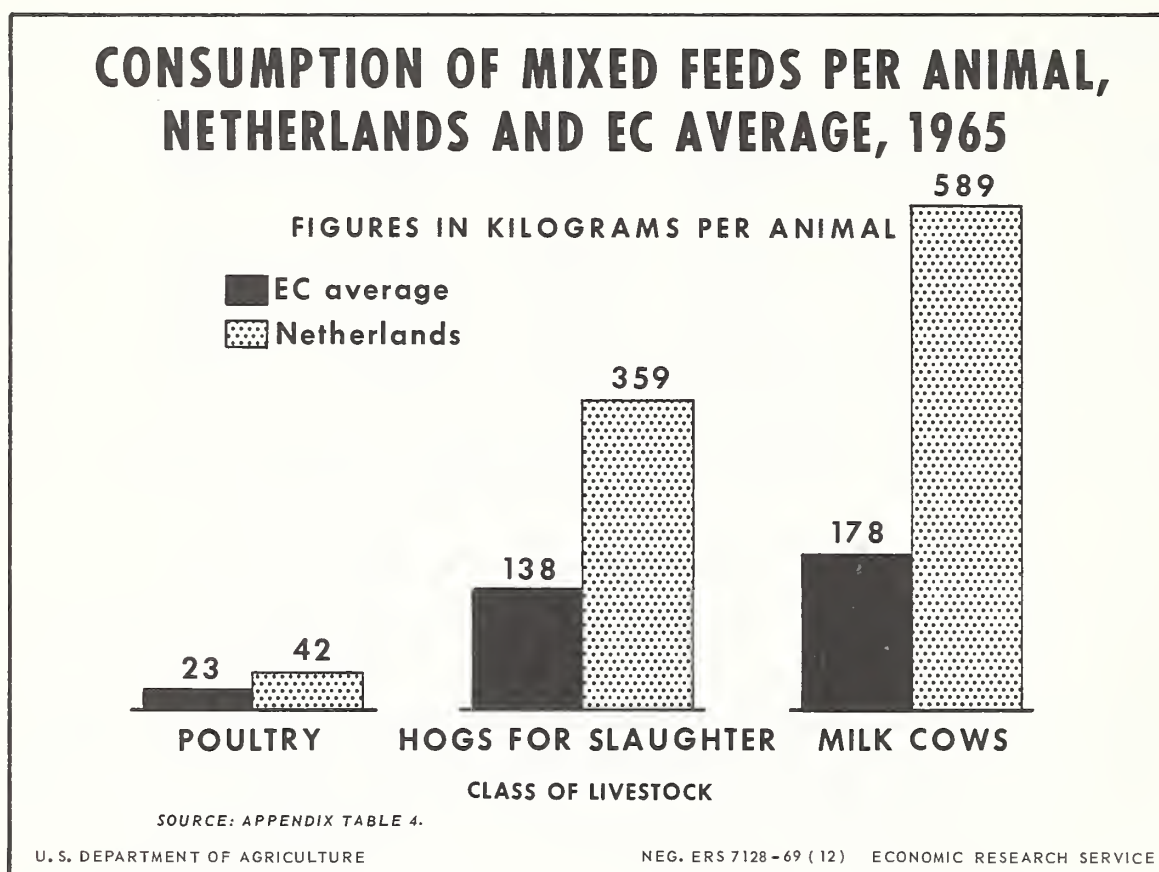


Figure 3

Although average EC consumption rates of mixed feeds are relatively low, consumption rates in Belgium and northern Germany are comparable to those in the Netherlands. Feed mixing in southern Germany is just beginning to develop. Further comparisons in the use of mixed feeds by EC member countries may be made by using appendix table 4.

FACTORS AFFECTING THE AMOUNT AND TYPE OF GRAIN USED IN FEED CONCENTRATES

The livestock sector of the economy is the primary user of grain in the Netherlands, accounting for about 70 percent of total grain consumed (production plus imports) in 1966/67. However, in absolute terms the amount of grain used for feed declined from 4.1 million tons in 1960/61 to 3.3 million in

1967/68 (app. table 2). The proportion of grain in concentrate feed declined from 68 percent at the beginning of this decade to 45 percent in 1967/68. It is important to note that expansion of the livestock industry helped keep the absolute level of grain utilization from falling further.

Corn is the only grain whose use as a feed has continued to increase in recent years, and thus has constituted an increasing proportion of grain used for feed. Because domestic production of corn for grain is practically nil, increased feeding of corn has been paralleled by increased imports of corn. Imports rose from 1.4 million tons in 1960/61 to 2.5 million in 1967/68. The U.S. share of this market has gradually increased--from 75 percent in 1960/61-1962/63 to 83 percent in 1965/66-1967/68.

Sorghum, barley, rye, and oats used for feed have declined in both absolute and relative importance in the Netherlands. This development is reflected in imports of each grain, all of which have declined substantially since 1960/61. Imports of these four grains from the United States have shown a corresponding decline.

Total utilization of wheat in the Netherlands declined from an annual average of 1.4 million tons in 1960/61-1962/63 to 1.1 million in 1965/66-1967/68, and this downward shift closely corresponds with the decline in wheat used for feed. During 1960/61-1962/63, 336,000 tons of wheat were used annually for feed, compared with 59,333 tons in 1965/66-1967/68. Wheat imports from non-EC suppliers are limited to hard varieties used for flour milling rather than for feed (app. tables 2 and 3).

Price Relationships Between Grains and Between Grain and Other Feed Ingredients

Grain is declining in importance as a feed in the Netherlands primarily because of its price relative to prices of other feed concentrates. In 1960/61, for example, corn, sorghum, and barley imports were subject to levies of \$5.55, \$8.33, and \$19.44 per ton, respectively (table 4). EC establishment of grain target prices, intervention (support) prices, and threshold (minimum import) prices in July 1962 increased these levies substantially. Between July 1961 and August 1968, net import levies per ton of corn, sorghum, and barley increased \$32.05, \$30.47, and \$5.76, respectively. But in many cases, levies or duties of similar magnitudes have not been applied to feed products that compete with grain.

Corn gluten feed, dehydrated alfalfa, beet pulp, soybeans, and soybean meal, for example, enter the EC duty- and levy-free from all suppliers, as was true before the EC grain marketing regulation (table 4). External tariffs on soybeans and soybean meal are bound at zero under the General Agreement on Tariffs and Trade (GATT).

While import charges are applied to manioc roots and meal, they are quite low relative to the levy on grain. In 1968/69, the combined levy and duty per ton of manioc meal was about one-fifth the levy on corn and sorghum. Manioc chips and meal are subject to an import duty that contains a fixed and a variable element. The variable element is calculated at 18 percent of the import

levy on barley. Although the fixed portion of the duty is \$2.50 per ton, it has not been charged on imports of manioc roots or chips (table 4).

Table 4.--Netherlands: Levy or duty applicable for selected feed items, 1960/61 and 1968/69

Commodity	1960/61		1968/69	
	Duty per	Levy per	Duty per	Levy per
	metric ton	metric ton	metric ton	metric ton
	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Corn.....	0	1/5.55	0	2/37.60
Barley.....	0	1/19.44	0	2/25.20
Sorghum.....	0	1/8.33	0	2/38.80
Corn gluten.....	0	0	0	0
Beet pulp.....	0	0	0	0
Waste from brewing and roasting houses.....	0	0	0	0
Soybeans.....	0	0	0	0
Soybean meal.....	0	0	0	0
Manioc chips.....	0	0	3/	2/4.54
Manioc meal.....	0	0	2.50	2/4.54
Dehydrated alfalfa.....	0	0	0	0

1/ Levy applicable in July. To limit frequent changes of the import levies, import prices (including the levies) were allowed to fluctuate within price limits which were \$4.17 per ton higher and lower than target prices. Thus, minimum import prices were established \$4.17 per ton lower than target prices.

2/ Levies applicable Aug. 1.

3/ As yet a duty has not been applied to manioc chips.

EC import policies have not maintained a competitive relationship for imports of all feedstuffs. This situation reflects the major importance of grain production in the EC and the EC's attempt to improve farm incomes by maintaining high grain prices.

Corn is the primary feed grain imported from the United States by the Netherlands. This is because of the EC's self-sufficiency in wheat and barley and the relatively favorable threshold price of corn compared with other grains. The Netherlands' imports of corn from the United States increased from 951,000 tons in 1960/61 to 1.9 million tons in 1967/68.

Sorghum competes primarily with corn in the Netherlands' feed grain market. However, the threshold price established for sorghum is not in line with its relative feeding value when compared with corn's. This accounts for declining sorghum imports--from 696,000 tons in 1960/61 to 361,000 tons in 1967/68. When used as a cattle and swine feed, sorghum has a feeding value about 90 to 95 per cent of corn's. Corn and sorghum are almost equal in feeding value for

poultry. 3/ The 1967/68 basic threshold price (July 1) of corn was \$88.38. On the basis of the feeding value of sorghum for beef and swine, the 1967/68 price of sorghum--relative to the price of corn--should have ranged from between \$79.54 and \$83.96 per ton. However, in that year the threshold price for grain sorghum was set at \$85.44. A similar price relationship persisted in 1968/69 (table 5).

Table 5.--European Community: Price relationships of principal feed grains and relative feeding values, 1968/69

Commodity	Threshold prices per metric ton:		Calculated	Feed values 2/ 1/
	1967/68	1968/69	prices per	
			metric ton (1968/69) 1/	
	----- Dollars -----			
Corn.....	88.38	92.69	102.33	100.0
Barley.....	89.00	92.19	92.10	90.0
Wheat.....	104.38	104.38	104.38	102.0
Sorghum.....	85.44	89.00	94.66	3/92.5

1/ Calculated from relative feed values, based on a threshold price of \$104.38/metric ton for wheat. Calculated prices estimate threshold prices that would equate feeding values.

2/ Estimated relative feed values.

3/ Average feed value of sorghum for hogs and cattle.

Sources: (2, p. 4) and (17, pp. 1073-1981).

Under 1968/69 price relationships in the Netherlands (and the EC), corn was favored for feed over barley and wheat. Corn and good quality wheat are considered by European experts to be approximately equal in feeding value, while the value of barley for feed is about 90 percent that of corn. 4/ Target prices for corn, barley, and wheat were \$94.94, \$94.44, and \$106.25 per ton, respectively, for August 1, 1968 (most grain deficit area). Many European experts contend that the target price of corn should be closer to wheat's to reflect more accurately their feeding value. 5/ This would encourage feeding of EC surplus soft wheat. (For more detail on this matter, see p. 32).

3/ (17, pp. 455-456).

4/ Feed values for corn, sorghum, barley, and wheat vary with the quality of the grain and by type of livestock. In particular, the feed value of corn exceeds that of some European soft wheats by as much as 2 to 10 percent.

5/ It should be made clear, however, that corn/soft wheat market price relationships are more favorable to wheat than target prices indicate. The surplus of soft wheat has resulted in prices near intervention levels, while corn prices have remained close to target levels.

Table 5 (cols. 1 and 2) provides comparative information on grain threshold prices, showing the sharp increase in the threshold prices of corn and sorghum between 1967/68 and 1968/69. Based on U.S. estimates of feeding values of grain (table 5, col. 4)--which give a lower feed value rating to corn relative to wheat than given by European researchers--the threshold prices of corn and sorghum are still below their relative feeding values in 1968/69. This situation could lead to further adjustments in the threshold prices of these two grains--as indicated by the calculated prices--and provide even more incentive to the importation of other feed products which substitute for grain. 6/

Mixed Feed Prices Relative to Feed Grain Prices

Mixed feed prices have been an important influence on the amount of grain used in feed concentrates. Although retail prices of mixed feeds have risen steadily since 1959/60, the price of feed grain has risen at a faster rate. Consequently, use of mixed feeds--incorporating larger proportions of nongrain components--has been encouraged at the expense of direct use of grains. Relative to unmixed grain, mixed feeds have become better and better buys for Dutch farmers. Table 6 lists retail prices of selected mixed feeds from 1959/60 to 1966/67 and shows the percentage increase in price during this period. Prices of mixed rations for hogs and poultry increased 27-32 percent, while prices of mixed feeds fed to cattle and calves increased 15-19 percent. On the other hand, the minimum import price of corn, sorghum, and barley increased 49, 54, and 35 percent, respectively, during essentially the same period (table 7). It is also important to note that the mixed feed prices given are retail prices, while the threshold prices for grains do not include internal transportation, handling, or marketing costs. The minimum import prices of feed grain have increased more in line with aggregate agricultural cost factors, which rose 44 percent between 1959/60-1966/67, than have mixed feed costs.

Increased Use of Linear Programing in the Mixed Feed Industry

Changing price relationships among feed ingredients have precipitated increased use of grain byproducts and "exotic" feeds. However, several other factors--particularly the increased use of linear programing in determining the composition of the mix--have contributed substantially to these developments.

The Netherlands' mixed feed industry was already well-established before the EC increased variable levies on grain. In 1960/61, over two-thirds of all concentrate feeds produced were mixed feeds. However, substantial grain price changes in 1962 brought about a revaluation of feed formulation in the livestock industry. The mixed feed industry was technically advanced and it assumed the lead in expanding the use of computer technology in the mixed feed complex.

6/ Corn and barley prices were increased \$1.00 per ton for the 1969/70 season; barley intervention prices were increased \$.50 per ton.

Table 6.--Netherlands: Retail prices of selected mixed feeds, 1959/60-1966/67

Year	Price per 100 kilograms					
	Cattle cake, high protein	Calf meal, high protein	Pig meal, high protein	Farrowing meal, high protein	Laying meal, incomplete ration	
1959/60.....	9.42	9.37	8.25	8.49	9.10	
1960/61.....	9.02	8.62	7.91	8.07	8.46	
1961/62.....	9.91	9.42	8.97	9.17	9.53	
1962/63.....	10.47	9.81	9.22	9.45	9.83	
1963/64.....	10.50	9.83	9.33	9.53	10.06	
1964/65.....	10.69	10.30	10.11	10.44	10.83	
1965/66.....	10.94	10.66	10.55	10.99	11.41	
1966/67.....	11.18	10.79	10.79	11.18	11.54	
Percentage increase, 1959/60-1966/67.....	19	15	31	32	27	

Source: (14, p. 118).

Table 7.--Netherlands: Threshold (or minimum) import prices for coarse grains
and c.i.f. price of soybeans, 1959-67

Year	Prices per 100 kilograms, July			
	Corn	Sorghum	Barley	Soybeans (c.i.f.)
			<u>Dollars</u>	
1959.....	5.97	5.57	6.62	9.35
1960.....	5.97	5.31	6.77	6.50
1961.....	6.39	6.11	7.08	11.09
1962.....	7.08	6.88	7.78	10.21
1963.....	7.39	7.15	7.95	11.02
1964.....	7.61	7.38	8.13	11.10
1965.....	8.49	7.70	8.92	11.54
1966.....	8.73	8.45	8.91	12.49
1967.....	8.90	8.60	8.96	11.38
Percentage increase, 1959-67.....	49	54	Percent 35	22

Source: (14, p. 122) and (16, p. 725).

The computer, through linear programming, was introduced on a wide scale to evaluate feed ingredients in terms of their relative feeding value. In the simplest terms, linear programming is a tool enabling management to organize resources or enterprises to minimize costs of production or to maximize profits. In the case of feed formulation, the mixed feed industry has employed linear programming techniques to determine the least-cost combination of ingredients within given constraints; i.e., minimum protein content, maximum fiber content, maximum animal fat content, and so forth. Current market prices for raw materials are fed into a computer for analysis on a frequent basis (sometimes weekly). Computer printouts (see app. table 5 for a sample) provide current information to the feed mixer on the proportion of ingredients to be used at existing prices. This information enables the feed mixer to formulate a live-stock ration that meets specified feed standards at a minimum cost.

Linear programming information is available to most mixed feed manufacturers in the Netherlands. However, few small feed mixers own and operate computers because of the high cost involved and the technical knowledge required. Cooperative feed mixers rely on Cebeco or C.I.V. for linear programming information (see pp. 29, 30 for information about Cebeco and C.I.V.). Even mixers who do not have access to computers gain knowledge of profitable changes in the composition of feeds. Most cooperatives, although not required to do so by law, attach the feed formula to each bag of mixed feed.

Widespread application of linear programming in the Netherlands has accentuated the long-term decline in grain used in concentrated feed. Appendix table 6 shows a comparison of a hog feed formulated early in the 1960's with a similar ration formulated in 1968. The nutritional value of both feeds is considered equal, but the 1968 formulation is only 34 percent grain while the earlier ration is 70 percent grain.

Linear programming has permitted feed mixers to explore the potential of nearly every available feed that is palatable or nutritious. When prices of the mixed feed ingredients change, the effect on demand is registered almost immediately in the feed industry. Consequently, the Dutch livestock feed industry, which continues to rely very heavily on imported feed concentrates, is very sensitive to price changes.

Growth of the Mixed Feed Industry

The shift in use of ingredients in mixed feeds has been affected by the growth of the industry. Concentrate rations prepared by industrial processors contain less grain than those rations prepared on farms. In 1965, 57 percent of all concentrates fed to livestock in the Netherlands were grain. However, only 42 percent of all concentrates used by the mixed feed industry were grain. Consequently, as the mixed feed industry expands its relative share of concentrate feeds that are fed by farmers, consumption of grain is affected.

The mixed feed industry makes possible the increased use of grain byproducts and many other nongrain feed ingredients. A substantial knowledge of prices, relative feeding values, and nutritional requirements, plus investment

in equipment for handling and mixing, are needed to purchase and use lower cost ingredients. These requirements exceed the capacities of individual farm operations.

FACTORS AFFECTING USE OF NONGRAIN FEED INGREDIENTS

The declining importance of grain as a feed in the Netherlands has brought about increased use of some nongrain feed ingredients. Included in the non-grain category are high protein meals, manioc, sugar, certain dairy products, molasses, and selected "other" commodities (such as animal and vegetable oils, feed peas, and potatoes). These commodities, which are replacing grain in livestock rations, are discussed below.

High Protein Feeds

Dutch farmers are now feeding more high protein feeds than ever before. However, the demand is being supplied only in part by traditional protein-rich feeds such as oilseed cake and meal, meat meal, and fish meal. Since 1960/61, use of other high protein feeds (such as milk powder, corn gluten, feed peas, and alfalfa and grass meals) has increased substantially.

Feeding of high protein cakes and meals--oilseed, animal, and fish--has not increased as a proportion of concentrates fed (app. table 2). In 1955/56, these ingredients accounted for 16 percent of the concentrates fed and remained near this proportion through 1967/68. The balance between use of animal protein (including fish) and oilseed cakes and meals is about the same as in 1955/56. In 1955/56, about four parts of vegetable oilseed cake and meal to one part of animal and fish meal was being used in concentrate feeds. This ratio narrowed to about three to one in 1960/61. Since 1960/61, however, oilseed cake and meal have gradually regained their earlier position relative to animal (and fish) protein.

Animal protein, in the form of meat meal, is a byproduct of livestock slaughterhouses. Its future world supply will be commensurate to further expansion in the livestock industry. Fish meal can be a byproduct of the fish processing industry, or "rough" fish catches may be processed into fish meal. Since Peru is the world's largest supplier of fish meal--accounting for 60 percent (by weight) of world exports in 1967 (app. table 7)--its export prospects are critical to the world supply. Peru exported 1.4 million tons of fish meal in 1964 and 1965, 1.3 million tons in 1966, and 1.6 million in 1967. A recent study by the Food and Agriculture Organization concluded that world anchovy numbers have been depleted appreciably and that a maximum catch was probably reached in 1967. Fishermen have experienced increasing difficulty in obtaining good catches in recent years (1).

Total consumption of vegetable oil cake and meal in the Netherlands increased 13 percent between 1962 and 1967 (table 8). Consumption of soybean cakes alone increased 65 percent during this period. Thus, soybean cake and meal have been increasing their share of the vegetable protein market, rising from 39 percent in 1962 to 56 percent in 1967. Consumption of other types of

vegetable oil cake and meal has varied substantially from year to year, with consumption of many types having gradually declined. Major exceptions are cake and meal produced from sunflower and colza (rape).

Table 8.--Netherlands: Apparent consumption of oil cakes and meals, 1962-67 1/

Type of oil cake or meal	1962	1963	1964	1965	1966	1967
	<u>1,000 metric tons</u>					
Linseed.....	186	173	211	166	151	96
Peanut.....	37	39	34	20	27	33
Soybean.....	296	269	332	378	403	489
Sesame.....	19	19	15	11	13	5
Cottonseed.....	64	76	67	64	63	46
Sunflower.....	94	92	62	70	123	117
Copra.....	29	12	50	27	38	49
Palm kernel.....	-4	11	4	-4	3	-3
Rape seed.....	29	33	25	34	49	26
Other.....	14	12	13	12	16	9
Total.....	764	736	813	778	886	867

1/ Imports plus production minus exports.

Sources: (13, p. 96) and (19, various annual reports).

Future U.S. exports of oilseeds and oil cake and meal to the Netherlands will depend considerably on the outcome of a recent proposal by the Commission of the European Community to levy a consumption tax on products of oilbearing materials of vegetable and marine origin that are used for food or feed. The proposal calls for a consumption tax of about \$60 per ton for vegetable oils and \$30 per ton for oil cake and meal (special arrangements would be made for reimbursing trade losses suffered by the Associated Overseas Territories of the EC). Certain animal fats may also be subject to a tax. The proposed taxes would be applied to both imports and indigenous production and are designed, according to the Community, to aid in solving surplus problems in the EC by curtailing milk production, encouraging consumption of butter relative to consumption of margarine, and promoting increased use of grain--particularly barley and soft wheat.

The United States exported over \$525 million of vegetable oil, oilseeds and oil cake and meal to the EC in 1967. Soybeans and oil cake and meal enter the EC duty free (a GATT tariff binding is in effect), while vegetable oils are subject to a duty of 9-15 percent. The impact of consumption taxes on U.S. exports to the Netherlands will depend on the absolute level of the taxes and the level of taxes on oilseed cake and meal relative to that in effect for substitute products such as corn gluten, meat meal, and fish meal.

Corn Gluten Feed

Use of corn gluten as a feed ingredient has increased spectacularly in the Netherlands. Imports of corn gluten into the Netherlands rose from 49,000 tons in 1959/60 to 453,000 in 1967/68 (table 9). Since 1962/63, the United States has supplied about 80 percent of the Dutch import market. The sharp increase in use of corn gluten feed began in 1962/63 and is linked with the application of higher levies on grain under EC grain marketing regulations. Total availability of corn gluten feed in the Netherlands is shown in appendix table 2.

Table 9.--Netherlands: Imports of corn gluten feed and the U.S. share, 1959/60-1967/68

Year	Imports		Year	Imports	
	Total	From United States		Total	From United States
	- - 1,000 metric tons - -			- - 1,000 metric tons - -	
1959/60.....	49	28	1964/65.....	230	190
1960/61.....	41	11	1965/66.....	331	284
1961/62.....	48	16	1966/67.....	384	299
1962/63.....	82	62	1967/68.....	453	360
1963/64.....	184	138			

Source: Foreign Agr. Serv., U.S. Dept. Agr.

Corn gluten is a byproduct of the wet-milling process of starch manufacturing (other byproducts include germ, bran, and corn solubles). Corn gluten feed consists of corn gluten (processed into a meal) and corn bran, with or without corn solubles. Corn gluten feed contains at least 25 percent protein, while corn gluten meal is manufactured to contain either 41 or 60 percent protein. Although rich in protein, corn glutens are not considered to be good-quality proteins. ^{7/} They are fed primarily to dairy cattle.

The future of corn gluten as a livestock feed in the EC depends upon its price relationship to grain and other high-protein feeds. ^{8/} If applied to corn gluten, EC Commission proposals to tax protein meals could lower its level of use (current proposals do not specifically mention corn gluten). Unlike grain, corn gluten feed now enters the EC free of duties or levies. There presently is little basis to assume that the favorable prices for corn gluten compared with grain will be changed. Any price increases for grain would encourage greater use of corn gluten feed.

^{7/} (17, pp. 423-424).

^{8/} When fed to dairy cattle, corn gluten feed is worth approximately 115 percent (by weight) of the value of corn. In 1968, the average value of a ton of imported corn gluten feed was less than a ton of imported corn. As long as import prices reflect this difference, the use of corn gluten feed will probably continue to expand.

Manioc

Manioc has become increasingly important as an ingredient in mixed feed in the Netherlands and several other EC countries. A recent study by the International Trade Center, GATT, discusses the use of manioc in the Netherlands, West Germany, and Belgium (12). Much of the following discussion is based on this GATT report.

Manioc is a root of a plant widely grown in areas of Asia, Africa, and Latin America. It is exported in root forms--which include chips and pellets--or as flour and meal. Most feed mixers are using the root forms of manioc. Manioc is an energy feed and competes directly with barley, corn, and other grain. It is used mostly in mixed feeds for hogs.

The Netherlands, West Germany, and Belgium accounted for 97 percent of EC imports of manioc in 1967 (table 10). From \$27 million in 1962, total EC imports increased to \$51 million in 1967. Although feed mixers had long been aware of manioc's potential for use in feed, manioc was not used extensively until 1962. The introduction of variable levies on grain has encouraged use of manioc (see table 4 for a comparison of selected levies and duties) by the feed mixing industries of the Netherlands, West Germany, and Belgium, and these countries will probably import larger amounts in the future.

Table 10.--European Community: Imports of manioc and manioc products, 1962 and 1967

Country	1962		1967	
	<u>1,000 dol.</u>	<u>1,000 M.T.</u>	<u>1,000 dol.</u>	<u>1,000 M.T.</u>
West Germany.....	24,151	366.1	32,879	532.7
Netherlands.....	70	1.2	9,181	158.8
Belgium.....	1,517	23.0	7,109	113.3
France.....	1,730	23.4	1,548	20.4
Total EC.....	27,470	413.7	50,824	826.5

Source: (12).

The content of manioc in mixed feed now averages about 10 percent in West Germany and about 3 percent in the Netherlands. The GATT study concluded that since about half of the ingredients in mixed feeds are grain, manioc could be used more extensively in the EC.

Sugar

Sugar is being used in livestock feeds in the Netherlands and other EC countries (table 11). EC use of sugar in feed increased from nil in 1960/61 to an estimated 340,000 tons in 1968/69. Raw sugar has been imported for feed, and on a limited scale EC-produced surpluses are being denatured for feed (i.e., rendered unfit for human consumption).

Table 11.--European Community: Utilization of sugar for feed, 1960/61-1968/69

Country	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
Netherlands....	---	2	2	2	1	1	1	75	150
Belgium- Luxembourg....	---	---	---	---	---	---	---	30	30
West Germany....	1	2	47	4	62	220	281	250	100
France.....	---	40	8	6	9	59	66	1/70	60
Italy.....	---	---	---	---	---	---	---	---	---
EC.....	1	44	57	12	72	280	348	1/425	340

1/ Estimated.

Sources: (22), and Foreign Agr. Serv., U.S. Dept. Agr.

Sugar is a high energy food and is used in feeding rations for calves and chickens, but mostly for pigs. The level of sugar use in rations in the EC has generally been less than 10 percent. Sugar mixes well in feeds and requires no special mixing equipment. ^{9/} Its use as a livestock feed in the EC has been encouraged by a combination of surplus sugar production in the EC and low world prices for raw sugar.

During the fifties, sugar production in the EC plus supplies from French Overseas Departments approximated consumption in the Common Market. However, beginning in the early 1960's, production increased faster than consumption and the Common Market became a net exporter of sugar. Exportable surpluses produced in 1963 and 1964 were marketed at reasonable prices, but in 1965 world sugar prices fell sharply--from \$126 per ton (5.72 cents per pound) in 1964 to \$44.50 per ton (2.02 cents per pound) in 1965 (table 12). The EC began using substantial quantities of denatured sugar for feed in 1965. Since then, world sugar prices have remained low, and larger amounts of sugar have been used for feed in the EC.

The EC sugar regulation that became effective in July 1968 and favorable weather resulted in even larger surplus production in 1968/69. EC sugar production is supported at levels substantially above world prices. The EC intervention (support) price for 1968/69 was \$212.30 per ton for white sugar. The average world price for raw sugar during the first two-thirds of 1968 was \$39.20 per ton (table 12). Under the regulation, surplus sugar can be either denatured and used as livestock feed, or moved into world markets; in either case a substantial subsidy is required. A comparison of these two alternatives indicates that disposal of surplus EC sugar is expensive under either alternative but that denaturing sugar and using it for feed is probably less costly than exporting it when world sugar prices are depressed.

Alternative I.--Sugar prices in the EC were supported at \$212.30 per ton (3rd-quality sugar) in 1968/69. To make sugar attractive as a feed in the EC, it was subsidized so that its market price was 90 percent of the market price of corn. Using the market price of \$97.50 per ton for corn, a denaturing subsidy of about \$140.30 per ton of sugar was paid on sugar used for feed. ^{10/}

^{9/} This is true as long as the percentage does not exceed the 10-percent level.

^{10/} The \$140.30 denaturing subsidy was calculated as follows:

Support price (3rd-quality sugar)	=	\$212.30 per metric ton
Quality allowance (due to quite limited supplies of 3rd-quality sugar)		2.50 per metric ton
Technical costs of denaturing		6.00 per metric ton
Transportation costs to feed mill		7.00 per metric ton
Total		\$227.80
Minus:		
Market price of corn (\$97.50)		
times 90 percent = \$87.75 but rounded by the EC to		\$ 87.50
Denaturing premium		\$140.30

Assuming that 1 ton of sugar replaced about 0.9 ton of imported corn, the import levy of approximately \$34 per ton was forfeited. Under these circumstances, the net cost to the EC Agricultural Fund for use of domestically produced sugar as feed in the EC was approximately \$174.30 per ton (\$140.30 plus \$34).

Table 12.--Raw sugar price, f.a.s. Cuba, 1962-68 1/

Year	Price per pound	Price per kilogram
	Cents	Cents
1962.....	2.80	6.17
1963.....	8.31	18.32
1964.....	5.72	12.61
1965.....	2.02	4.45
1966.....	1.76	3.88
1967.....	1.88	4.14
1968 <u>2/</u>	1.78	3.92

1/ Price calculated for implementation of International Sugar Agreement. Simple average of daily prices, London and No. 8 spot New York, both adjusted to f.a.s. (free alongside ship) Cuba.

2/ Jan.-Aug.

Alternative II.--Assuming white sugar sells for about 50 percent more than raw sugar, its value would be about \$45 per ton when raw sugar sells for \$30 per ton. The export subsidy required to move sugar into world markets, excluding transportation and marketing costs, would be \$167.30 per ton (\$212.30 minus \$45).

A comparison of the \$174.30 denaturing subsidy per ton and the \$167.30 export subsidy suggests that there would be a saving of \$7 per ton by exporting. However, since the export subsidy does not include transportation and marketing costs and since the denaturing subsidy includes a \$7 cost per ton for transporting the sugar to the feed mills, the net cost of the denaturing subsidy would probably be less than that of the export subsidy. Also, Dutch experts maintain that 1 ton of sugar will substitute for 1.012 tons of corn. In this case, a denaturing subsidy of around \$129-\$130 per ton (rather than \$140.30) would be sufficient to move sugar into feed use.

Disposal of surplus sugar production is costly to the EC Agricultural Fund as well as to sugar producers and beet growers. Consequently, production quotas for each EC country are likely to be adjusted to bring production and consumption more nearly in line. But surplus sugar production is likely to persist for some time, and present high price levels for grain--combined with depressed world prices for sugar--will continue to result in some surplus being used in feed in the EC.

Dairy Products

Milk production in the Netherlands and throughout the EC is increasing faster than consumption. The Community has established a target price for raw milk (at the farm) of \$10.30 per 100 kilograms and has authorized government agencies to purchase butter and nonfat dry milk at support prices of \$173.50 and \$41.25 per 100 kilograms, respectively (1968/69 prices). ^{11/} Milk producers have responded to the high price incentives by producing large EC-held stocks of butter and nonfat dry milk.

Provisions of EC dairy regulations, supplemented by other measures, have proved inadequate for disposal of surplus dairy products. At the end of 1968, butter stocks were estimated at about 300,000 tons.

The EC has hinted that some butter stocks may be disposed of in feed. However, when the costs of alternative disposal programs are considered, it seems unlikely that large quantities of butter will be fed. Butter (82 percent butterfat) is a high-energy food, and each unit supplies about 1.8 times the energy of the same weight of corn. Subsidies to encourage use of butter in feed in the EC would have to be at least \$156 per 100 kilograms ^{12/} for butter to effectively compete with corn. At the same time, subsidies on butter exports (82 percent butterfat) to the United Kingdom were \$106.50 per 100 kilograms in July of 1968. Subsidies on butter exports to other third countries were higher.

Nonfat dry milk is being used for feed in the EC. It is generally used as a milk replacer for calves or used in poultry feeds and in feeds for small pigs. Since 1960, the amount of nonfat dry milk used for feed in the EC has increased from 80,000 tons to 715,000 in 1967 (table 13).

It seems likely that as milk production continues to increase in the EC, use of nonfat dry milk for feed will also increase. (This will be the case if 1969/70 price proposals for a direct aid of \$38.25 per kilograms are approved by the EC Council.) The world market for nonfat dry milk is depressed. So far,

^{11/} Commission price proposals for 1969/70 include substantially lower prices for butter (\$111.00 per 100 kilograms) but sharply increased prices for nonfat dry milk (\$71.25 per 100 kilograms). Direct aid to users of nonfat dry milk for feed would be increased from \$8.25 to \$38.25 per 100 kilograms, while aid to users of liquid skim milk for feed would be increased from \$1.50 to \$4.25 per 100 kilograms.

^{12/} This rough calculation disregards the protein and mineral value of corn and assumes the following: (a) Butter, which is 82 percent butterfat, would supply 1.8 times the energy of a similar unit of corn; (b) corn is valued at \$9.27 per 100 kilograms, the 1968/69 threshold price. The denaturing subsidy for butter would need to be higher than \$156 per 100 kilograms if the protein and mineral content of corn were considered.

Community subsidies for feed use have been less than export subsidies. Export subsidies in July 1968 for nonfat dry milk (less than 1.5 percent butterfat) were \$20-\$23 per 100 kilograms, while subsidies paid on nonfat dry milk for calf milk replacer averaged \$8.25 per 100 kilograms. ^{13/} Until the world market for nonfat dry milk improves, the EC will probably continue to rely more on feeding than on exporting.

Table 13.--European Community: Production of feed concentrates containing nonfat dry milk powder and amounts of powder used, 1960-67

Year	Production	Amounts of nonfat dry milk powder used in feed
	<u>1,000 metric tons</u>	
1960.....	123	80
1961.....	216	140
1962.....	293	190
1963.....	380	247
1964.....	634	412
1965.....	745	484
1966.....	946	615
1967.....	1,100	715

Source: Monthly Bulletin of Agricultural Economics and Statistics. FAO, Rome, Sept. 1968, p. 17.

Other Commodities

Molasses.--Molasses from cane or beets is a satisfactory substitute for part of the corn in a ration and is most commonly used in rations for ruminants. However, molasses generally supplies less feed nutrients per unit of weight than does corn.

Use of molasses in feeds has risen consistently in the Netherlands, increasing fivefold between 1955/56 and 1967/68 (app. table 2). In 1955/56, molasses accounted for slightly over 1 percent of concentrates fed; it accounted for 3.6 percent in 1966/67. Molasses is particularly beneficial when used with poorer quality feeds since it makes them more palatable. Assuming that the price of molasses remains competitive, the increasing use of inferior-quality concentrate feed ingredients in the Netherlands should encourage continued use of molasses.

^{13/} A much higher subsidy--\$27-\$28 per 100 kilograms--is needed to move nonfat dry milk into pork or poultry rations. This subsidy would bring the price below world market levels.

Animal and vegetable oils (excluding dairy products).--Feed mixers in the Netherlands are using animal fats and vegetable oils in mixed feeds, particularly in pig and poultry rations. Fats and oils are being added to mixed feeds for additional energy; they supply approximately 2.25 times as much energy per pound as digestible carbohydrates do (17, p. 83). Fats and oils are being incorporated by feed mills rather than by farmer-feeders because these products require special processing equipment.

The level of fats and oils used in any ration is low--generally less than 2 percent. However, between 1962 and 1968, fats and oils used by the mixed feed industry in the Netherlands quadrupled (table 14). In 1962, fats and oils were about 0.5 percent of mixed feed production; the proportion had increased to about 1.8 percent by 1968.

Feed mixers are incorporating some unprocessed oilseeds in mixed feeds. Little is known about the level of use. Data in table 14 do not include oils from unprocessed oilseeds.

Table 14.--Netherlands: Fats and oils used in mixed feeds, 1962-68

Type of commodity	1962	1963	1964	1965	1966	1967	1968
	<u>Metric tons</u>						
Animal fats.....	15,920	20,320	29,160	32,740	35,720	54,480	100,590
Vegetable oils...	9,070	12,310	18,790	18,340	19,030	18,950	17,780
Total.....	24,990	32,630	47,950	52,080	54,750	73,430	118,370

Source: Foreign Agr. Serv., U.S. Dept. Agr.

Feed peas.--Feed peas are becoming more important as a feedstuff in the Netherlands. Peas are an excellent feed in that they contain as much protein as corn gluten feed while supplying more total digestible nutrients (17, pp. 495-496).

The major restriction to the use of feed peas has been their generally high cost relative to that of other feeds. However, since 1964/65, larger quantities of feed peas have been imported by the Netherlands--mainly from the USSR (table 15). Future imports by the Netherlands will depend on the availability of feed peas on world markets and their price relative to prices of other protein sources. Supplies fluctuate substantially from one season to another.

Table 15.--Netherlands: Imports of feed peas and the USSR share, 1959/60-1967/68

Year	Imports		Year	Imports	
	Total	From USSR		Total	From USSR
	- - 1,000 metric tons - -			- - 1,000 metric tons - -	
1959/60.....	36	---	1964/65.....	122	94
1960/61.....	16	---	1965/66.....	375	343
1961/62.....	17	---	1966/67.....	136	61
1962/63.....	40	---	1967/68.....	108	29
1963/64.....	19	---			

Source: Foreign Agr. Serv., U.S. Dept. Agr.

Potatoes.--While potatoes are not used in mixed feeds, they are high in starch and substitute to some degree for grain, particularly for ruminants and in pork production. Yearly use of potatoes as feed by Dutch farmers depends on the level and quality of indigenous production. In recent years, potatoes used for feed have averaged about 16 percent of total potato production. Since several crops in the crop rotation scheme have become financially unprofitable for Dutch farmers, there has been a tendency in recent years for them to increase production of potatoes, with consequent higher availability of potatoes for feed (table 16) at relatively low prices. Since the Dutch ruminant and pig population has continued to climb, further gains in feed usage of potatoes can be expected up to 20-25 percent of domestic potato production.

Table 16.--Netherlands: Production of potatoes and use of potatoes for feed, 1950/51 and 1961/62-1967/68

Year	Production			Year	Production		
	Potatoes for feed				Potatoes for feed		
	Total	Percentage			Total	Percentage	
	Amount	of total	production		Amount	of total	production
	1,000	1,000		1,000	1,000		
	M.T.	M.T.	Percent	M.T.	M.T.	Percent	
1950/51...	4,173	1,356	31	1964/65...	4,110	649	16
1961/62...	3,270	572	15	1965/66...	3,230	375	12
1962/63...	3,953	517	13	1966/67...	4,124	716	17
1963/64...	3,854	710	18	1967/68...	4,840	903	19

Source: (14).

STRUCTURE AND SELECTED CHARACTERISTICS OF THE MIXED FEED INDUSTRY

Production by Size of Firm

The Dutch feed industry had its beginning in small mills that received farmers' grain and custom milled it. The industry has grown to become highly technical and complex. The large feed manufacturers are now importers and merchandisers as well as processors.

Today's feed mixing industry is characterized by a few large firms and hundreds of small operators. It is estimated that there were over 1,149 firms in 1967/68, but one-fifth of the firms produced four-fifths of the industry output (6.4 million tons). In 1967/68, 216 large firms averaged 24,250 tons of output annually, compared with an average of about 1,200 tons for the 933 smaller firms (table 17).

The large number of small firms indicates a potential for further acceleration of structural change. Since 1961, the number of units with 10 or more employees has declined 12 percent, but output has increased 34 percent (table 18). CEBECO, a large wholesale cooperative, has recommended to its member co-ops that new plants have an annual production capacity of about 50,000 tons (assuming a one-shift operation). ^{14/} Plants now of this size employ about 50 persons.

Private Versus Cooperative Mixed Feed Enterprises

Output of mixed feed is about equally divided between private (51 percent) and cooperative firms (49 percent). Among the 1,149 firms listed in 1967/68, private companies produced 3.3 million tons of feed and cooperatives, 3.1 million tons (table 19). Slightly over 900 firms, or nearly 80 percent of the 1,149, were private. Most small-capacity firms in the Netherlands are in the private sector. In 1967/68, 854 privately owned firms produced a maximum of 10,000 tons of mixed feed, compared with 189 cooperative enterprises. In 1966/67, the figures were 961 and 213, respectively (20).

Labor Productivity

Technological innovations in the mixed feed industry have led to higher labor productivity despite industry structural problems. A labor census in September of each year gives an indication of productivity trends based on comparisons of output. The level of output per employee has increased rather steadily during the last 6 years, assuming no changes in the seasonality of employment. Most improvement occurred among firms with 50 or more employees; output of these firms increased from 357 to 511 tons per person, an increase of 43 percent (table 20). Output of firms with 10 to 49 employees increased from 392 to 428 tons per worker, a 9-percent rise. Although data are not available for plants with less than 10 employees, it is likely that their labor productivity increases have been small because such plants are less able to adopt technological innovations.

^{14/} For more information on CEBECO, see p. 30.

Table 17.--Netherlands: Production of mixed feed by capacity per firm, 1964/65-1967/68

Year	Firms with an annual capacity of --											
	All firms		Less than 500 M.T.		500-1,000 M.T.		1,000-5,000 M.T.		5,000-10,000 M.T.		10,000-50,000 M.T.	
	Firms	Output	Firms	Output	Firms	Output	Firms	Output	Firms	Output	Firms	Output
	No.	M.T.	No.	M.T.	No.	M.T.	No.	M.T.	No.	M.T.	No.	M.T.
1964/65.....	1,339	5,477	436	95	233	169	480	1,085	102	704	72	1,316
1965/66.....	1,349	5,960	425	100	236	171	n.a.	n.a.	103	715	79	1,866
1966/67.....	1,271	6,161	383	86	220	165	469	1,085	102	715	79	1,531
1967/68.....	1,149	6,392	329	74	183	135	421	944	110	751	89	1,765
											17	2,721

1/ Excludes specialty feeds like mineral and vitamin mixtures and calf milk feeds.

Source: Netherland's Product Board for Feed.

Table 18.--Netherlands: Production of mixed feed by number of persons employed per firm, 1961-66

Year	All firms		Firms employing 9 or less people		Firms employing 10 or more people					
					Total		10-49		50 or more	
	Firms	Output	Firms	Output	Firms	Output	Firms	Output	Firms	Output
	<u>No.</u>	<u>1,000 M.T.</u>	<u>No.</u>	<u>1,000 M.T.</u>	<u>No.</u>	<u>1,000 M.T.</u>	<u>No.</u>	<u>1,000 M.T.</u>	<u>No.</u>	<u>1,000 M.T.</u>
1961.....	n.a.	4,825	n.a.	1,285	286	3,540	243	1,294	43	2,246
1962.....	n.a.	4,975	n.a.	1,006	285	3,969	241	1,475	44	2,494
1963.....	n.a.	4,955	n.a.	1,010	281	3,945	239	1,464	42	2,481
1964.....	n.a.	5,246	n.a.	1,115	271	4,131	234	1,487	37	2,644
1965.....	n.a.	5,719	n.a.	1,387	260	4,332	223	1,553	37	2,779
1966.....	<u>1/1,852</u>	6,028	<u>1/1,600</u>	1,273	252	4,755	214	1,609	38	3,146,

1/ Estimated.

Sources: (4, various issues).

Table 19.--Netherlands: Output of mixed feed by size and class of firm, 1967/68 1/

Firm's yearly output (in 1,000 metric tons)	Total		Private companies		Cooperative enterprises	
	Firms	Output	Firms	Output	Firms	Output
	<u>Number</u>	<u>Metric tons</u>	<u>Number</u>	<u>Metric tons</u>	<u>Number</u>	<u>Metric tons</u>
Less than 3....	842	810,502	740	663,466	102	147,036
3-10.....	201	1,094,937	114	605,483	87	489,454
10-50.....	89	1,764,728	39	733,140	50	1,031,588
50-100.....	8	570,654	4	293,403	4	277,251
Over 100.....	9	2,150,698	6	994,958	3	1,155,740
Total.....	1,149	6,391,519	903	3,290,450	246	3,101,069
		<u>Percent</u>		<u>Percent</u>		<u>Percent</u>
Share of total..		100		51		49

1/ Excludes 500-600 very small firms.

Source: Foreign Agr. Serv., U.S. Dept. Agr.

Table 20.--Netherlands: Labor productivity in the mixed feed industry, 1961-66

Year	Firms with --					
	10-49 persons		50 or more persons		10 or more persons	
	Total personnel	Output <u>1/</u> per person	Total personnel	Output <u>1/</u> per person	Total personnel	Output <u>1/</u> per person
	<u>Number</u>	<u>Metric tons</u>	<u>Number</u>	<u>Metric tons</u>	<u>Number</u>	<u>Metric tons</u>
1961....	3,299	392	6,038	357	9,337	379
1962....	3,633	460	6,196	403	9,829	424
1963....	3,755	390	5,735	433	9,490	416
1964....	3,875	384	5,865	451	9,743	424
1965....	3,955	393	5,845	475	9,800	442
1966....	3,759	428	6,133	511	9,892	479

1/ As of September.

Source: (4, various issues).

Competition

The number of Dutch mixed feed firms is large, and products and prices are very competitive. The market for a firm can be country-wide, and the number of firms in each geographic area is usually adequate to assure competition.

However, the number of firms probably will decline. The portion of industry output supplied by the smaller firms seems a certain target for large plants hoping to improve utilization of plant capacity as well as for new plants for investors.

Factors encouraging a reduction in the number of small units are:

(1) Economies of scale: Although no report on economies of scale is available for the Netherlands, a report prepared on the U.S. feed manufacturing industry concludes that such economies do exist (23, p. 31). For example, the study found savings ranging from \$1.79 to \$2.56 per short ton (depending on the form in which the feed was manufactured) when the plant size increased from 80 to 300 tons of feed produced per day.

(2) Economies and advantages of market promotion: The longest and widest points of the Netherlands are 196 miles and 125 miles, respectively. Large centrally located producers are able to extend marketing activities to most areas of the country. Small regional producers cannot match extensive promotional activities of large competitor firms.

(3) Credit and other services: Larger feed companies are better able to extend credit and technical advisory services and are equipped for bulk deliveries of feed. Small plants are usually not competitive in these areas.

Marketing of Mixed Feeds

Mixed feeds are sold in bulk, paper sacks, and burlap bags. Burlap bags are the most popular container. In 1967/68, 46 percent of all sales were in burlap bags and 33 percent were in paper sacks. Thus, bulk feeds represented 21 percent of that year's sales (table 21). In recent years, there has been a strong trend in favor of bulk feeds at the expense of feed in burlap bags. Development of bulk facilities at the mill and the farm is inevitable. Lower costs and the convenience of bulk feeds will encourage their increased use.

Industry Organizations 15/

Most cooperatives in the Netherlands are represented by one of the two national associations listed below. Both are large wholesale buyers and sellers for their members.

(1) CIV (Coöperatieve Centrale Landbouw In-en Verkoopvereniging G.A.) is a Catholic organization that represents mixed feed producers in southern Nether-

15/ (13, pp. 97-99).

Table 21.--Netherlands: Percentage of sales of mixed feeds in bulk, paper sacks, and burlap bags, 1967/68

Item	Total	Cattle feeds <u>1/</u>	Pig feeds <u>2/</u>	Poultry feeds <u>3/</u>
	- - - - -	<u>Percent</u>	- - - - -	- - - - -
Bulk.....	21	7	21	37
Paper sacks.....	33	55	24	24
Burlap bags.....	46	38	55	39

1/ Excludes milk replacer feeds but includes mixed feed for sheep and horses.

2/ Includes milk feeds.

3/ Includes mixed grain.

Source: (14).

lands and has about 500 members.

(2) CEBECO (Nationale Cooperatieve Aan-en Verkoopvereniging G.A.) is a Protestant organization that represents feed mixers in northern Netherlands and has about 350 members.

Fifteen large private compounders are represented by the trade organization Vereniging van Nederlandse Mengvoederfabrikanten. Approximately 1,100 small manufacturers are associated with Algemene Nederlandse Molenaarsbond. In addition, a semigovernmental agency, Produktschap Voor Veevoeder, promotes trade in animal feedstuffs.

Regulatory Control

Government regulations on mixed feeds are very limited in the Netherlands. In general, they concern imported protein, fishmeal manufactured in the Netherlands, mineral mixtures, mixtures containing antibiotic additives, and hormone and medicinal preparations. Most control over feed manufacturing is of a voluntary nature. A private organization, Stichting C.L.O.-Controle, establishes standards for simple and mixed feeds. Manufacturers complying with these standards receive C.L.O. approval, which is considered essential for farmer acceptance.

IMPLICATIONS FOR THE FUTURE

Although the preceding analysis is confined largely to feed concentrates used in the Netherlands, its basic implications extend considerably to the entire EC. This is because agricultural policies and price relationships effective in the Netherlands are part of an overall common agricultural policy applying to all member countries of the EC. The Netherlands is simply in the vanguard of developments outlined in the preceding sections of this report.

Future Position of the Netherlands

The widespread use of computers in feed formulation and the relatively heavy dependence of the Netherlands on imported feedstuffs are likely to keep the Netherlands more responsive to the possibilities of substituting feed components than most other EC countries. Nevertheless, Belgium and German feed mixers, for example, are using large amounts of grain substitutes in livestock rations. However, in West Germany, the amount of grain consumed by livestock continues to increase because of the large quantities of grain produced domestically and the lower degree of market penetration by the mixed feed industry. Mixed feed manufacturing and use in France and Italy are expanding, but the relative proportions of mixed feed in total feed concentrates used is much lower there than in Belgium or the Netherlands. Consequently, there is much latitude for expansion in mixed feed production in the three largest EC countries--France, West Germany, and Italy--and a potential for sharply increased use of nongrain components in concentrated feeds.

Shifts in Common Agricultural Policy

The European Community's Common Agricultural Policy, which will continue to be an important factor in determining the utilization of feed components, may be on the threshold of some basic changes. The CAP supports farm incomes through a system of high guaranteed producer prices. These prices, which are sometimes 100-300 percent above world levels, have stimulated agricultural output in the Community more than was first anticipated. Large surpluses of butter, sugar, and soft wheat have now been accumulated by storage agencies at prices substantially above these commodities' export value. Increased production, the extension of the CAP to more commodities, and the absorption of total intervention and disposal costs have caused the cost of the CAP to increase from \$37.8 million in 1962 to \$1.7 billion in 1967/68. Some EC officials predict that without policy changes the cost will increase to \$10 billion in 1980. EC policy makers recognize the untenable nature of present policies and have proposed a number of short- and long-term measures to lessen the EC's agricultural problems. These proposals, if adopted, will have a significant impact on the feed sector of the EC.

Tax on Protein Meals and Vegetable Oils

One provision of the "Mansholt Plan" ^{16/} calls for a consumption tax on vegetable oils, oil cake and meal, fish oil and meal, and some animal fats. The proposed tax would be \$60 per ton for most fats and oils and \$30 per ton for oil cake and meal and fishmeal. The objective of this tax is to help alleviate surplus of dairy products, primarily butter. One specific aim is to reduce dairy farmers' use of high-protein meals, which some EC officials claim are responsible for the large increases in milk yields and output. Officials hope that the proposed tax would induce farmers to substitute grain for oil cake in dairy rations as well as in swine and poultry rations.

The United States is vitally concerned with the Community's proposed consumption tax on protein meals, vegetable oils, and other plant and animal proteins. U.S. exports of oilseeds and products to the Netherlands were valued at \$489 million in 1968. The effect of a consumption tax on imports of oils and protein meal would depend on the magnitude of the tax. However, a tax of almost any level would probably be detrimental to the United States.

Price Relationships for Wheat, Feed Grain, and Other Concentrate Feeds

A continuation of EC grain prices at current or higher levels will further encourage substitution of nongrain feedstuffs (corn gluten, manioc, feed peas, and others) for grain in livestock rations. ^{17/} This will have a depressing effect on feed use of grain and on feed grain imports. However, the EC is deficient in animal feeds, and the EC market for them will expand if livestock output increases.

Another important factor affecting future feed grain requirements of the Community is the wheat/feed grain price ratio.

The EC exported an average of 3.7 million tons of wheat yearly during 1964-67 even though it was only about 80 percent self-sufficient in grain. A larger proportion of future EC wheat production may be diverted to feed use, and exports may thus decline. Wheat is an excellent feed and can be used as the only grain in poultry and swine rations, although mixtures are recommended. Good results have been achieved when beef cattle were fed concentrate rations that were one-half wheat. Approximately one-fifth of the wheat produced in the EC is used for feed.

Policy makers are already adopting policies encouraging further use of wheat for feed. Two policy adjustments that the EC is beginning to make are:

^{16/} The "Mansholt Plan" was submitted to the EC Council by the EC Commission in Dec. 1968. Included is a program for structural reform in the Community and a variety of short-run proposals, one of which is the consumption tax on oil and meal.

^{17/} Assumes that import taxes or levies on nongrain feedstuffs will not increase relative to grain prices.

(1) Equating prices for wheat, barley, and corn to relative feeding values.

(2) Increasing denaturing subsidies to bring more surplus wheat into feed use.

Adjusting prices of barley, wheat, and corn to reflect relative feeding values would eliminate the present distinction between the food and the feed markets for wheat. Soft wheat not purchased for milling would automatically move into the EC feed grain market without subsidy. This would require a lowering of the wheat price and/or a raising of feed grain prices. The latter is more likely. A decision by the EC to use its wheat internally would reduce U.S. feed grain exports to the EC below the level which would otherwise be attained. Except for 1.035 million tons of wheat which the EC is to donate under the Food Aid Convention of the International Grains Arrangement, most of its soft wheat could probably be consumed internally.

Exports of surplus wheat can be encouraged by provision of higher subsidies, or domestic feed use can be encouraged by provision of higher denaturing subsidies. The EC Commission has increased the denaturing premium for wheat several times. The denaturing premium for the 1969/70 season ranges from 50.5 to 53 cents per bushel early in the season to 57.3 cents per bushel in May-July 1970, when the wheat is denatured with dye or fish oil. Comparable denaturing premiums for the direct use of wheat in mixed feed are 47.7-50.3 cents per bushel to 54.6 cents per bushel. These subsidies have pushed feed wheat prices below corn prices.

Expanded Market for Nongrain Feed Ingredients

The Dutch market for nongrain feed items has expanded as a direct result of the CAP established for grain in 1962. A continuation of high grain prices and an expanding livestock economy will lead to even further increases in the use of nongrain feed items. Market prospects are bright for high-energy and/or high-protein feeds with zero or low import charges. Assuming no substantial change in EC import policies, use of manioc, corn gluten feed, feed peas, oil-seed meals, dried pulp, brewers grains, animal and fish meals, and grass and alfalfa meals will increase.

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SELECTED TERMS

CIF price: A price that includes cost of the goods, insurance charges for the shipment, and freight charges to a named destination.

Common Agricultural Policy: The EC's system of farm policies that are essentially uniform throughout the area with respect to production and marketing within the EC and to trade with outside countries (the recent devaluation of the French franc has lessened the uniformity). The common market for agricultural products has been established for over 85 percent of EC production.

Concentrates: Feeds that are low in fiber and high in total digestible nutrients. They may be either low or high in protein.

Denaturing: A process whereby a food item is made unsuitable for human consumption but is left usable for livestock feed. Provision of a denaturing premium (subsidy) makes the item attractive as a feed in the lower priced market.

European Agricultural Guidance and Guarantee Fund (EAGGF): The fund established by the EC for financing its Common Agricultural Policy. The EAGGF is composed of a Guarantee Section and a Guidance Section. The former finances the common organization of markets by paying subsidies on exports to third countries and making intervention purchases in domestic markets. The Guidance Section provides funds to improve the agricultural structures of member states.

European Community: Various referred to as European Economic Community, Common Market, Community, and so forth. It represents the economic integration of Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands. Although there are still officially three communities within the EC--the European Coal and Steel Community (ECSC), the European Economic Community (EEC), and the European Atomic Energy Community (EURATOM)--a treaty to replace the three separate treaties creating the three communities is due to be negotiated. The area will eventually have common policies with respect to agriculture, transport, taxes, and foreign trade.

General Agreement on Tariffs and Trade: A multilateral agreement, of which the United States is a signatory, to increase international trade by reducing tariffs and other barriers.

Intervention agencies: Organizations authorized by the EC to purchase commodities, which are eligible for support, at intervention price levels.

Intervention price: A price analogous to the U.S. "support price." It is the level--applicable to certain commodities of the EC's CAP--at which the EC makes purchases to provide price protection to EC farmers.

Kilogram: A unit equaling 2.2046 pounds.

Note: Most definitions were taken from Terms Used in International Agricultural Trade, U.S. Dept. Agr., FAS-M-152, revised. Apr. 1967.

Metric ton: A unit equaling 1,000 kilograms or 2,204.6 pounds.

Mixed feed: Feed that includes both complete feeds and high-protein supplements which are added to grain. Feed "custom mixed" by livestock producers is not considered as output by the mixed feed industry.

Target price: The price level that the EC seeks to attain at wholesale for commodities covered by the CAP.

Threshold price: A minimum import price established by the EC at a level that will not prejudice the sale of EC commodities covered by the CAP at or near the target price.

Variable levy: A levy on products imported by the EC that usually equals the difference between the higher EC threshold or gate price and the price of products offered by non-EC countries at the EC frontier.

APPENDIX

Appendix table 1.--Netherlands: Animal numbers, 1959-67

Year	Cattle	Hogs	Sheep	Chickens
	1,000 head 1/			
1959.....	3,163	2,938	294	30,555
1960.....	3,228	2,934	263	32,995
1961.....	3,387	3,187	284	37,187
1962.....	3,521	3,156	267	37,978
1963.....	3,226	3,022	260	39,190
1964.....	3,317	3,525	286	39,196
1965.....	3,465	3,987	316	41,363
1966.....	3,556	4,079	370	43,800
1967.....	3,639	4,540	340	n.a.

1/ December census.

Source: Agricultural Statistics, Statistical Office of the European Economic Community. No. 7. Brussels, 1968.

Appendix table 2.--Netherlands: Consumption of feed concentrates, 1955/56 and 1960/61-1967/68

Item	1955/56	1960/61	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68 ^{1/}
	<u>1,000 metric tons</u>							
Grain.....	2,762	4,096	3,664	3,886	3,704	3,287	3,356	3,250
Grain products.....	331	414	430	487	466	576	663	784
Pulses.....	32	48	35	32	151	374	185	155
Oil cake.....	517	682	757	721	783	880	892	914
Animal protein.....	126	209	220	228	226	211	219	239
Skim milk powder.....	8	60	101	141	150	145	135	153
Dried pulp.....	80	176	150	167	220	225	304	382
Grass, clover, and alfalfa.....	42	110	150	204	163	210	237	266
Molasses.....	50	100	120	150	160	200	250	250
Corn gluten feed.....	---	65	114	220	274	392	444	520
Manioc products.....	---	---	1	1	42	109	106	191
Minerals and other.....	61	101	115	129	103	131	139	194
Total.....	4,009	6,061	5,857	6,366	6,442	6,740	6,930	7,298
Grain as percentage of total.....	69	68	63	61	57	49	48	45
Mixed feed as percentage of total concentrates fed.....	72	76	84	79	85	88	89	n.a.

^{1/} Includes preliminary data and estimates.

Sources: (14, p. 87), (22, p. 20), and Foreign Agr. Serv., U.S. Dept. Agr.

Appendix table 3.--Netherlands: Grain supply and utilization, 1955/56 and 1960/61-1968/69

Item	1955/56	1960/61	1961/62	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69
					1,000 metric tons					
Corn:										
Total utilization.....	551	1,511	1,484	1,436	1,857	1,796	1,845	2,223	2,591	1,967
For feed.....	476	1,389	1,349	1,301	1,704	1,627	1,664	2,023	2,013	1,385
Total imports.....	623	1,428	1,520	1,692	1,899	1,694	2,001	2,203	2,485	1,832
From U.S.....	305	951	1,154	1,384	1,567	1,473	1,779	1,852	1,948	1,290
Sorghum:										
Total utilization.....	270	692	651	647	689	601	593	449	432	208
For feed.....	n.a.	n.a.	n.a.	810	676	683	685	454	371	165
Total imports.....	270	696	663	689	703	631	607	456	361	164
From U.S.....	257	621	521	613	568	596	596	318	243	56
Wheat:										
Total utilization.....	1,205	1,468	1,617	1,232	1,198	1,143	1,089	1,121	1,815	2,076
For feed.....	66	358	479	170	118	96	47	81	51	288
Total imports.....	806	718	1,021	501	763	689	722	595	881	1,284
From U.S.....	481	243	592	234	512	240	368	400	290	286
Barley:										
Total utilization.....	837	553	468	505	440	433	448	450	620	609
For feed.....	761	457	371	408	335	321	324	320	334	350
Total imports.....	683	321	334	259	230	214	294	184	160	209
From U.S.....	591	194	152	175	108	60	85	25	4	---
Rye:										
Total utilization.....	554	533	463	539	488	495	362	250	283	277
For feed.....	436	451	384	460	418	425	286	178	166	150
Total imports.....	128	101	174	243	190	143	129	63	43	36
From U.S.....	93	42	47	122	104	19	16	39	31	17
Oats:										
Total utilization.....	810	778	730	756	635	547	468	347	448	394
For feed.....	763	741	695	720	604	519	441	324	287	265
Total imports.....	232	280	221	222	118	134	141	68	81	73
From U.S.....	188	214	32	119	42	33	102	41	15	11
Domestic production.....	1,779	1,882	1,762	2,005	1,807	2,015	1,779	1,626	1,859	1,653
Grain imports 1/.....	2,742	3,544	3,933	3,606	3,903	3,505	3,894	3,569	4,011	3,598
Grain imports from U.S. 1/.....	1,915	2,265	2,498	2,647	2,901	2,421	2,946	2,675	2,531	1,660
Total domestic utilization.....	4,230	5,554	5,396	5,082	5,336	5,141	4,802	4,865	4,886	4,230
Total grain for feed.....	2,762	4,096	3,902	3,664	3,886	3,704	3,340	3,391	3,250	2,650
Grain consumed on the farm..:	761	658	493	497	382	338	234	180	n.a.	n.a.

1/ Excludes miscellaneous grains.

Source: (22), and Foreign Agr. Serv., U.S. Dept. Agr.

Appendix table 5.--Netherlands: Sample computer printout of five alternative complete laying rations 1/

Item	Price per 100 kg.	Rations				
		1	2	3	4	5
	<u>Dollars</u>	<u>Kilograms</u>				
Corn.....	9.46	65.0	65.0	65.0	57.6	65.0
Sorghum.....	9.32	3.0	0.5	2.3	---	5.2
Manioc.....	7.72	---	---	---	5.0	---
Rice feed meal.....	8.00	---	---	---	10.0	---
Wheat millings.....	7.86	7.6	6.4	5.8	---	4.4
Corn gluten feed.....	8.13	2.5	---	0.9	4.2	0.7
Corn gluten meal.....	9.87	---	10.0	---	---	---
Sunflower meal.....	8.34	5.0	5.0	5.0	5.0	5.0
Peanut feed.....	10.50	3.6	0.7	4.2	3.9	4.6
Fish meal.....	13.93	3.0	2.5	3.5	3.0	3.3
Animal meal.....	11.37	5.0	3.1	5.0	5.0	5.0
Alfalfa meal.....	6.26	2.5	4.0	2.5	3.5	2.5
Molasses.....	3.75	---	---	3.0	---	---
Minerals.....	6.19	2.5	2.5	2.5	2.5	---
Minerals.....	5.28	---	---	---	---	4.0
Vitamins.....	19.33	0.3	0.3	0.3	0.3	0.3
	<u>Unit</u>	<u>Rations</u>				
		1	2	3	4	5
Calculated analysis:						
Energy.....	Calories/kg.	2,900	2,900	2,900	2,900	2,900
Protein.....	Pct.	17	17	17	17	17
Calcium.....	do.	1.21	1.10	1.24	1.23	1.77
Phosphorus.....	do.	0.78	0.70	0.77	0.81	0.85
Lysine.....	do.	0.70	0.61	0.71	0.71	0.71
Methionine.....	do.	0.33	0.37	0.33	0.33	0.33
Methionine plus cystine.....	do.	0.62	0.69	0.61	0.60	0.61
Tryptofan.....	do.	0.18	0.18	0.18	0.18	0.18
Arginine.....	do.	1.05	0.90	1.07	1.09	1.07
Cost per 100 kg.....	dol.	9.39	9.34	9.28	9.22	9.39

1/ Sixteen different ingredients have been theoretically combined to indicate the approximate cost of raw materials and the various portions of each required. The calculated analysis indicates that all rations are very similar. This ration was formulated in mid-1968.

Appendix table 6.--Netherlands: Comparison of similar nutritive value mixed feed rations for pigs, 1968 and early 1960's 1/

Ingredient	1968	Ingredient	Early 1960's
	<u>Kilograms</u>		<u>Kilograms</u>
Corn.....	24.0	Corn.....	25.0
Sugar.....	4.0	Rye.....	25.0
Barley.....	10.0	Sorghum.....	9.75
Tapioca root.....	5.0	Barley.....	10.0
Wheat millings.....	11.5	Soybean meal.....	4.0
Peas.....	18.5	Whale meal.....	4.5
Grass meal.....	4.5	Grass, clover, and	
Corn glutenfeed.....	11.0	alfalfa meal.....	5.0
Animal fat.....	1.0	Corn gluten meal.....	10.0
Animal meal.....	1.0	Minerals.....	1.5
Vitamins.....	0.5	Vitamins.....	.25
Minerals.....	2.0	Molasses.....	5.0
Molasses.....	5.0		
Total.....	100.0	Total.....	100.0
	<u>Percent</u>		<u>Percent</u>
Grain as percentage		Grain as percentage	
of total.....	34	of total.....	70

1/ The quality of the feed in terms of digestible protein, net energy, fiber content, and so forth is considered to be about equal.

Appendix table 7.--Fishmeal exports of principal fishmeal-producing countries, 1964-67

Country	1964	1965	1966	1967
	<u>1,000 metric tons</u>			
Chile.....	148.0	70.5	185.9	111.2
Angola.....	54.4	48.0	53.6	42.0
Iceland.....	127.5	149.2	172.3	132.5
Norway.....	182.8	259.8	266.4	486.8
Peru.....	1,426.1	1,412.8	1,304.5	1,560.9
South and Southwest Africa.....	254.7	232.8	165.6	286.0
Total of major exporters.....	2,193.5	2,173.1	2,148.3	2,619.5

Source: (1, p. 6).

Appendix table 8.--Netherlands: Total nutrients utilized by livestock,
expressed in starch-values, 1960/61-1966/67

Year	Total	Feed concentrates <u>1/</u>	Roughage
	<u>Million starch units</u>		
1960/61.....	9,579	3,928	5,651
1961/62.....	9,485	4,322	5,163
1962/63.....	9,183	4,046	5,137
1963/64.....	9,397	4,361	5,036
1964/65.....	9,559	4,438	5,121
1965/66.....	9,681	4,710	4,971
1966/67.....	10,022	4,874	5,148

1/ Includes calf milk feed.

Source: Netherland's Product Board for Feed.

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